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(54)名 稱：帶自鎖儲能裝置的螺栓

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[57]申請專利範圍：

1.一種帶自鎖儲能裝置的螺栓，包括螺桿及螺母，其中，螺母內壁嚙合有一上鎖簧；螺母的下端部設有一個橫向解鎖孔，上端面設有一個固定槽，上鎖簧的一端卡設在固定槽中，另一端插在解鎖孔中。

2.根據申請專利範圍第1項所述的螺栓，其中，所述螺桿形成直徑不同的兩部分，螺桿靠下端部分的直徑較小，直徑較小部分嚙合有一下鎖簧，直徑較大部分的下端部設有一解鎖槽，螺桿的下端部設有一個固定槽；下鎖簧的一端鉤挂在固定槽中，另一活動端插在螺桿的解鎖槽；下鎖簧組裝後，兩部分的螺紋形成統一的螺旋線。

3.根據申請專利範圍第2項所述的螺栓，其中，所述螺母還包含一個與其具有相同內螺紋的下螺母，下螺母與螺母結合為一體，下螺母內壁嚙合有一中鎖簧。

4.根據申請專利範圍第3項所述的螺栓，

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其中，所述螺桿外徑上嚙合有一儲能簧，儲能簧中包含具有自鎖作用的內鎖簧及具有推力作用的外扭簧。

5.根據申請專利範圍第3項所述的螺栓，其中，所述螺母內壁分為內徑不同的上、下兩段，內徑較小的上段與所述上鎖簧相嚙合，內徑較大的下段與所述下螺母外壁配合連接；螺母的上端面還設有一個用於插植所述儲能簧端部的盲孔。

6.根據申請專利範圍第3項所述的螺栓，其中，所述下螺母為帶有內螺紋的帽狀體，其內螺紋設有與所述中鎖簧相嚙合的螺紋，其外壁與所述螺母配合連接，下螺母的上端面設有固定槽，下螺母的扁狀帽邊上設有一解鎖孔。

7.根據申請專利範圍第3項所述的螺栓，其中，所述中鎖簧的一端設有較粗的固定端，其卡設在所述下螺母的固定槽中，中鎖簧的活動端插在下螺母的解

孔中。

8.根據申請專利範圍第2項所述的螺栓，其中，所述螺桿的底端面中心處設有一個凹孔，一卡頭插在凹孔處，所述螺桿下端的固定槽位於卡頭上。

9.根據申請專利範圍第8項所述的螺栓，其中，所述卡頭呈"凸"字形，上端設有與所述螺桿端部凹孔相配的凸柱，在底面設有安裝下鎖簧用的固定槽。

10.根據申請專利範圍第6項所述的螺栓，其中，所述螺母與下螺母的配合連接：螺母內壁下段設有螺距較小的螺紋，所述下螺母的外壁設有與螺母的螺紋嚙合的螺紋。

11.根據申請專利範圍第6項所述的螺栓，其中，所述螺母與下螺母的配合連接：螺母下段內壁的橫斷線為六邊形，所述下螺母上段外壁的橫斷線為與螺母內壁下段配合的六邊形。

12.一種帶自鎖儲能裝置的螺栓，包括螺桿及螺母，其中，螺桿形成直徑不同的部分，螺桿靠下端部分的直徑較小，直徑較小部分嚙合有一下鎖簧，下鎖簧組裝後，該兩部分的螺紋形成統一的螺旋線。

13.一種帶自鎖儲能裝置的螺栓，包括螺桿及螺母，其中，還包括一嚙合於螺桿外徑上的儲能簧，儲能簧中包含具有自鎖作用的內鎖簧及具有推力作用的外扭簧，螺母的上端面設有一個用於插植外扭簧端部的盲孔。

圖式簡單說明：

第一圖：本發明的帶自鎖儲能裝置的螺栓實施例的組合剖視圖；

第二圖：第一圖中螺桿的示意圖；

第三圖：第一圖中儲能簧的示意圖；

第四圖：第一圖中上螺母的立體示意圖；

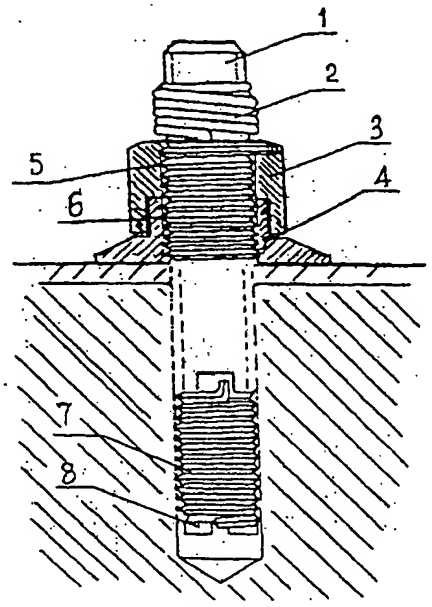
第五圖：第四圖所示上螺母的縱向剖視圖；

第六圖：第一圖中下螺母的立體圖；

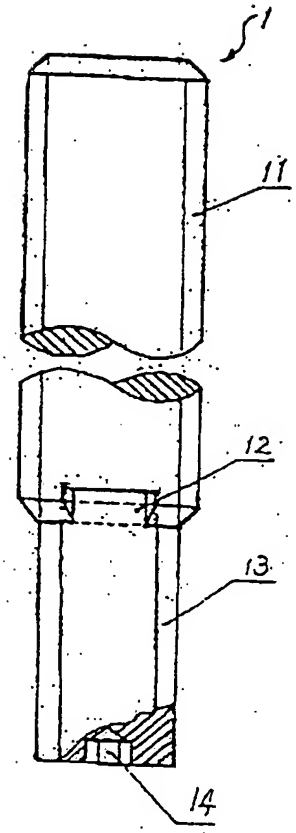
第七圖：第一圖中螺桿端處卡頭的示意圖；

第八圖：第七圖所示卡頭的頂視圖；

第九圖a、第九圖b、第九圖c：分別為第一圖中的上鎖簧、中鎖簧與下鎖簧的示意圖。

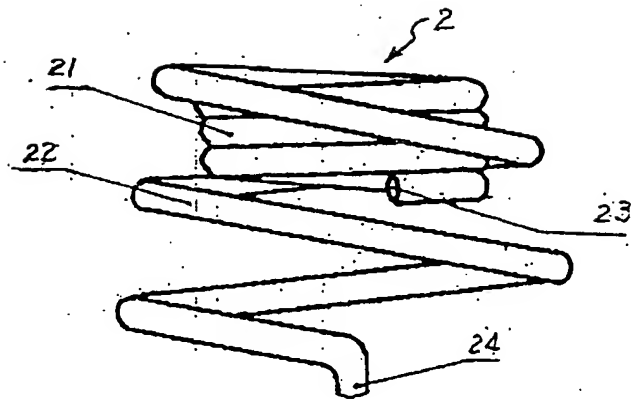


第一圖



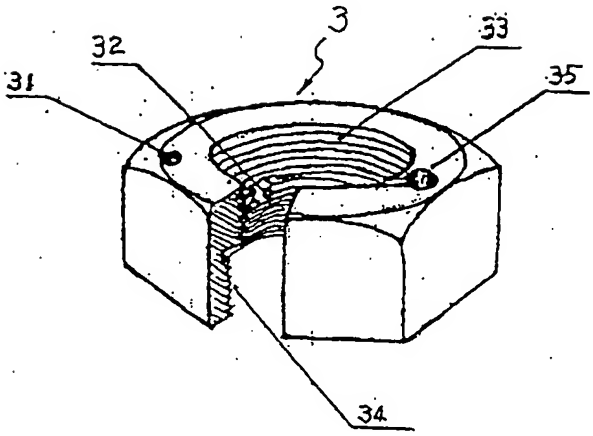
第二圖

(Fig. 2)



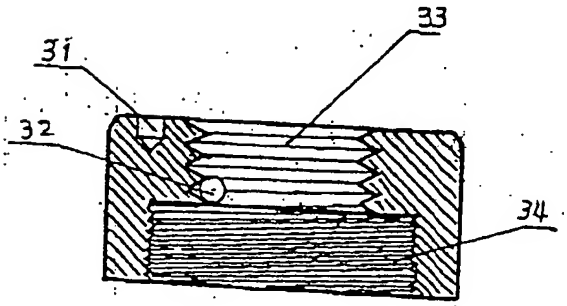
第三圖

(Fig. 3)



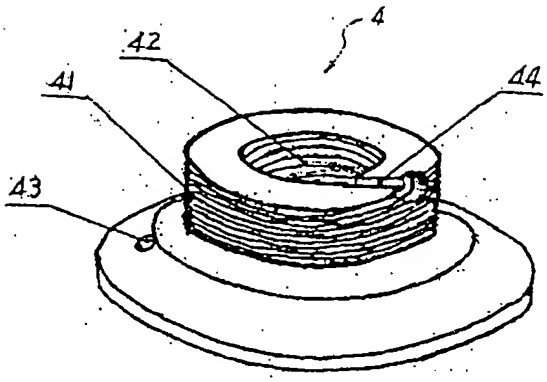
第四圖

(Fig. 4)



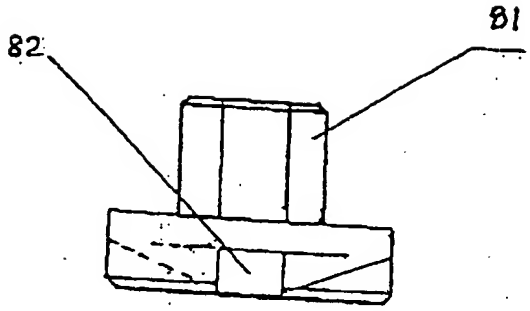
第五圖

(Fig. 5)



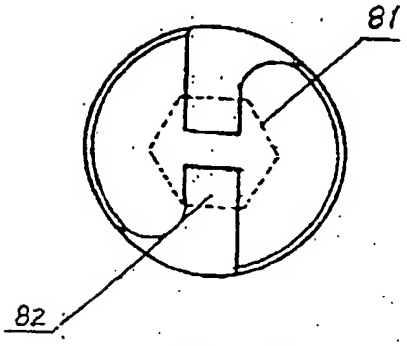
第六圖

(Fig. 6)



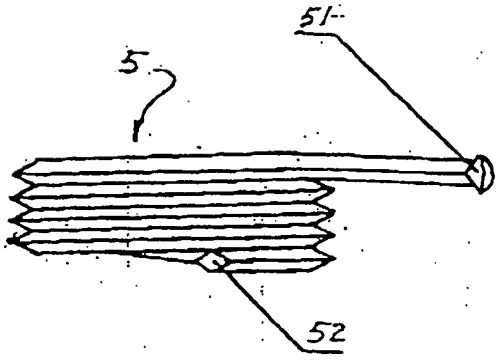
第七圖

(Fig. 7)



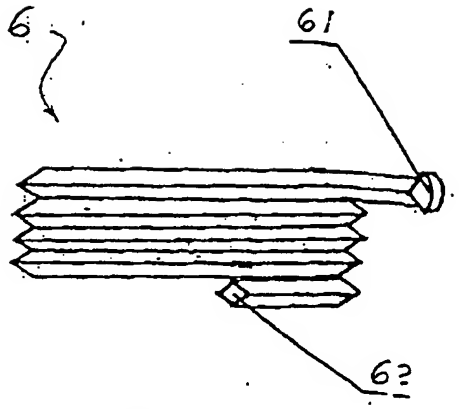
第八圖

(Fig. 8)



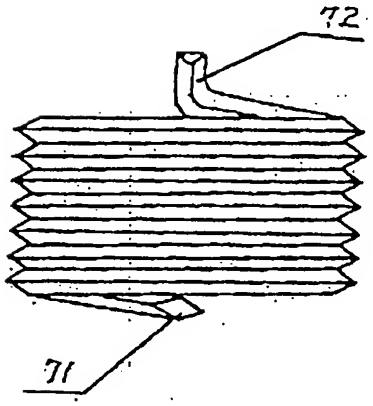
第九圖 a

(Fig. 9a)



第九圖 b

(Fig. 9b)



第九圖 c

(Fig. 9c)

Title: Bolt with self-locking energy storage device

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BOLT WITH SELF-LOCKING ENERGY STORAGE DEVICE

FIELD OF THE INVENTION

The present invention is related to the field of mechanical fastening means, and referred to a bolt with a self-locking energy storage device allowed for preventing looseness.

BACKGROUND

In the field of mechanical industry, the bolt is a basic fittings and connecting means. It is well known that the usage quantity and application field of the bolt is so large, such that the quality and performance thereof is paid attention to over a long period of time. The possibility of frequent looseness and detachment of the bolt, used as coupling basis, may emerges, due to the working environment of high-speed operation and intense vibration to which the mechanical apparatus is subject. With over a hundred years of experience, it has been proven that the additional fittings, such as spring washer, double nut, open lock, anti-withdrawal plate, as examples, frequently used for preventing looseness and detachment in the past, is incapable of meeting the need in practical use. It has been verified that under a long-period alternating loading or impact loading, the bolt, even fastened well, may lose pretension owing to the elongated deformation, fatigue collapse of the thread, leading to clearance and looseness. Then, the spring washer and the double nut may thus lose efficacy. Therefore, it would be desirable to find a novel bolt with higher reliability and safety in order to enhance the quality and performance of the mechanical coupling.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a bolt with self-locking energy storage device capable of both avoiding the looseness of bolt by itself and releasing stored energy simultaneously when wear or deformation of the bolt arises, by means of a fastening means allowed for self-locking and mutual locking with respect to a screw nut and a screw rod, as well as storing and releasing mechanical energy, in order for releasing the stored energy simultaneously to prohibit looseness.

For the purpose of achieving the aforementioned object, technical schemes described below are adopted in the present invention.

In the present invention, an engagement relation between a thread and a spiral of spring is used to compose a spiral self-locking and energy storage means, comprising a screw rod including two parts of an inner locking spring and an outer torsional spring, and an energy storage spring, a nut cap, and a lower nut cap engaged

with the screw rod, as well as an upper locking spring, a middle locking spring, and a lower locking spring engaged therewith, respectively; among all of which, direct engagement relation is presented. Moreover, a snap head used for prohibiting looseness is further provided at the bottom of the screw rod. A system with self-locking, mutual locking, and inter-locking, allowed for being tightly rotated only and incapable of being reversed, is constituted by these components, such that once the loss of fastening force resulted from wear, fatigue, plastic deformation arises, automatic fastening provided by forward rotation is obtained simultaneously by the use of stored mechanical energy in order to offset the present clearance.

The structure of the bolt with self-locking energy storage device according to the present invention is described as follows:

The bolt with self-locking energy storage device of the present invention comprises a screw rod and a nut cap, characterized in that the inner wall of the nut cap is engaged with an upper locking spring; the bottom end portion of the nut cap is provided with a lateral unlocking hole, and the top end face thereof is provided with a fixing groove, one end of the upper locking spring being snapped in the fixing groove, while the other end thereof being inserted into the unlocking hole.

The characteristic of the bolt is that the screw rod includes two portions with different diameters, a nearly lower portion thereof having a smaller diameter being engaged with a lower locking spring, in which threads of these two portions may be formed as a unified spiral after assembled.

The characteristic of the bolt is that the nut cap further comprises a lower nut cap having a thread the same as that of the nut cap, the lower nut cap and the nut cap being coupled as an unit, the inner wall of the lower nut cap being engaged with a middle locking spring.

The characteristic of the bolt is that at the outer diameter of the screw rod, there is engaged with an energy storage spring having an inner locking spring with self-locking effect and an outer torsional spring with thrust effect.

The characteristic of the bolt is that the bottom end portion of the portion of bolt having the larger diameter is provided with an unlocking groove, and the portion of bolt having the smaller diameter is engaged with the lower locking spring, a fixed end of the lower locking spring being hooked in the fixing groove at the bottom end portion of the screw rod, while a free end thereof being inserted into the unlocking groove of the screw rod.

The characteristic of the bolt is that the inner wall of the nut cap is divided into upper and lower sections with different inner diameters, the upper section with a smaller inner diameter being engaged with the upper locking spring, while the lower section with a larger inner diameter being fitted with the outer wall of the lower nut

cap, in which the top end face of the nut cap is further provided with a blind hole into which the end portion of the energy storage spring is inserted.

The characteristic of the bolt is that the lower nut cap is presented as a hat-like body having an inner thread, the inner thread thereof being engaged with that of the middle locking spring, the outer wall thereof being fitted with the nut cap, the top end face thereof being provided with a fixing groove, the flat brim thereof being provided an unlocking hole.

The characteristic of the bolt is that one end of the middle locking spring is provided with a thicker fixed end, snapped in the fixing groove of the lower nut cap, and a free end of the middle locking spring is inserted into the unlocking hole of the lower nut cap.

The characteristic of the bolt is that at the center of the bottom end face of the screw rod, there is provided with a recess hole into which a snap head is inserted, the fixing groove at the bottom end of the screw rod being disposed on the snap head.

The characteristic of the bolt is that the snap head is presented as "⊥ " shape, the top end thereof being provided with a projecting post fitted with the recess hole at the end portion of the screw rod, while the bottom face thereof being provided with a fixing groove used for the installation of the lower locking spring.

The characteristic of the bolt is that the fitting connection between the nut cap and the lower nut cap: the lower section of the inner wall of the nut cap having a thread with a smaller thread pitch, while the outer wall of the lower nut cap having a thread engaged with the thread of the nut cap.

The characteristic of the bolt is that the fitting connection between the nut cap and the lower nut cap: the cross section of the inner wall at the lower section of the nut cap is presented as hexagon, while the cross section of the outer wall at the upper section of the lower nut cap is presented as hexagon fitted with the former.

Another bolt with self-locking energy storage device of the present invention comprises a screw rod and a nut cap, characterized in that the screw rod includes two portions with different diameters, a nearly lower portion thereof having a smaller diameter being engaged with a lower locking spring, in which threads of these two portions may be formed as an unified spiral, after the lower locking spring is assembled.

Still another bolt with self-locking energy storage device of the present invention comprises a screw rod and a nut cap, characterized in that further comprises an energy storage spring engaged with the outer diameter of the screw rod, the energy storage spring including an inner locking spring with self-locking effect and an outer torsional spring with thrust effect, the top end face of the nut cap being provided with

a blind hole into which the end portion of the outer torsional spring is inserted.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1a is a cross section view of an assembled bolt with self-locking energy storage device according to one embodiment of the present invention;

Fig. 2 is a diagram of a screw rod shown in Fig. 1;

Fig. 3 is a diagram of an energy storage spring shown in Fig. 1;

Fig. 4 is a perspective view of an upper nut cap shown in Fig. 1;

Fig. 5 is a longitudinal cross section view of the upper nut cap shown in Fig. 4;

Fig. 6 is a perspective view of a lower nut cap shown in Fig. 1;

Fig. 7 is a diagram of a snap head at the end of the screw rod shown in Fig. 1;

Fig. 8 is a top view of the snap head shown in Fig. 7; and

Figs. 9a, 9b and 9c are diagrams of an upper locking spring, a middle locking spring, and a lower locking spring, respectively, shown in Fig. 1.

DETAILED DESCRIPTION

The feature of the present invention is further described below in company with the attached drawings and embodiments:

A bolt with a self-locking energy storage device, as shown in Fig. 1, comprises a screw rod 1, a lower locking spring 7, an upper locking spring 5, a middle locking spring 6, a lower nut cap 4, a nut cap 3, an energy storage spring 2, and a snap head 8. The lower spring 7 is disposed at the nearly lower end of the screw rod 1, and the lowest end of the screw rod 1 is fixed with the snap head 8. The upper locking spring 5 and the middle locking spring 6 are threadedly fixed at the middle top end of the fixing nut of the screw rod 1, while the exteriors of the upper locking spring 5 and the middle locking spring 6 are threadedly connected to the lower nut cap 4 and the nut cap 3. The top end of the nut cap 3 is fixed with the energy storage spring 2.

As illustrated in Fig. 2, there is shown a diagram of the screw rod 1 illustrated in Fig. 1. In this embodiment, a threaded portion of the screw rod 1 is divided into two sections with different diameters, in which the diameter of a nearly lower section of the screw rod 1 is smaller, while that of an upper section thereof is larger. Standard or non-standard threads may be used for a threaded portion with smaller diameter 13 and a threaded portion with larger diameter 11. At the end of the portion with larger diameter, there is provided with an unlocking groove 12; while at the center of the bottom surface of the screw rod 1, there is provided with a hexagonal or square recess hole 14. The threaded portion 13 is used for engaging with the lower locking spring 7, and the unlocking groove 12 is used for fixing a free end 72 of the lower locking spring 7 (as shown in Figs. 1 and 9c). The recess hole 14 is used for

fixing the snap head 8. The spiral formed by the engagement of the non-standard threaded portion 13 with the lower locking spring 7 should be consistent with the spiral of the standard thread on the upper portion of the screw rod 1.

As shown in Fig. 3, the energy storage spring 2 included in the bolt of the present invention may be divided into an inner locking spring 21 and an outer torsional spring 22. The end portion of the inner locking spring 21 of the energy storage device 2 is a free end 23. The end head of the outer torsional spring 22 is an outer hook 24 inserted into a blind hole of the nut cap 3 in use. With a continuous twist in use, the spacing of the outer torsional spring may be diminished gradually, and finally allowed to wrap around the inner locking spring. The self-locking effect is provided for the inner locking spring 21, while the thrust effect, as well as the effect of anti-withdrawal, energy storage, and energy releasing are provided for the outer torsional spring 22. Both of the elastic thrust and forward torque of the energy storage spring 2 are capable of rotating these inner locking spring and outer torsional spring in the forward fastening direction.

As illustrated in Figs. 4, and 5, there are shown, in Fig. 4, a perspective view of the nut cap 3 illustrated in Fig. 1, and, in Fig. 5, a longitudinal cross section view of the nut cap 3 illustrated in Fig. 4. The inner thread of the nut cap 3 provided according to this embodiment is divided into two sections with different inner diameters, i.e., a standard thread with smaller inner diameter 33 and a thread with larger inner diameter 34, in which the thread pitch of the latter is smaller than that of the standard thread. At the connection end of the standard thread 33 with the reverse thread 34, there is provided with a lateral unlocking hole 32. On the upper end face of the nut cap 3, a blind hole 31 and a fixing groove with larger end portion 35 are provided. The standard thread 33 is engaged with the upper locking spring 5 in use. The blind hole 31 is inserted with the outer hook 24 of the energy storage spring 2.

As illustrated in Fig. 6, there is shown a perspective view of the lower nut cap 4 illustrated in Fig. 1. The lower nut cap 4 is a hat-like body with inner and outer threads. In this embodiment, the inner thread is presented as a standard thread 42, while the outer thread is presented as a reverse thread 41 with smaller thread pitch. The upper end face of the lower nut cap 4 is provided with a fixing groove 44, while a flat brim of hat of the lower nut cap 4 is provided with an unlocking hole 43 thereon. The lower nut cap 4 is engaged with the nut cap 3 by means of the thread with smaller thread pitch 41 and the reverse thread 34, respectively. The standard thread 42 is engaged with the middle locking spring 6.

As illustrated in Figs. 7 and 8, there are shown diagrams of the snap head 8 fixed at the end of the screw rod 1 in the bolt illustrated in Fig. 1. In the present invention, the snap head 8 is provided with a projecting post 81 fitted with the recess

hole 14 disposed at the end of the screw rod 1, and a fixing groove 82 used for the installation of the lower locking spring.

As illustrated in Fig. 9, there are shown the upper locking spring 5, the middle locking spring 6, and the lower locking spring 7 in Figs. 9a, 9b, and 9c, respectively. In this embodiment, inner diameters of the upper locking spring 5 and the middle locking spring 6 are both a little less than the minor diameter of the screw rod 1 with which these two springs are engaged, in which the difference between these two diameters may be about 1/2 thread pitch. Moreover, the outer diameter of the lower locking spring 7 is a little larger than the major diameter of the screw rod 1 with which this spring is engaged, in which the difference between these two diameters may be about 1/2 thread pitch. One end of the upper locking spring 5 and that of the middle locking spring 6 are provided with wider fixed ends 51, 61, respectively, these two fixed ends being snapped into the fixing groove 35 of the nut cap 3 and the fixing groove 44 of the nut cap 4, correspondingly. The other end of the upper locking spring 5 and that of the middle locking spring 6 are free ends 52 and 62, respectively. When assembling, the upper locking spring 5 and the middle locking spring 6 are engaged with the nut cap 3 and the lower nut cap 4, respectively, and the free ends of the former are then disposed at the unlocking hole 32 of the nut cap 3 and the unlocking hole 43 of the lower nut cap 4, correspondingly. Subsequently, a fixed end of the lower locking spring 7 is hooked in the fixing groove 82 of the snap head 8, while a free end thereof is situated in the unlocking groove 12 of the screw rod 1.

The cross sections of numerous springs used in the bolt of the present invention may be presented as various geometric shapes, such as circle, ellipse, diamond, rectangle, and triangle, as examples. In this embodiment, the cross sections of the springs are presented as diamond.

The recess hole 14 at the center of the bottom end face of the screw rod 1 in this embodiment is presented as either hexagonal or square, while the corresponding projecting post 81 on the snap head 8 is also presented as either hexagonal or square, in order to prevent the relative rotation between the screw rod 1 and the snap head 8. In this embodiment, the cross sections of the recess hole 14 and the projecting post 81 are presented as hexagon.

In this embodiment, the coupling between the nut caps 3 and 4 may be achieved by not only the thread, but also the clasping connection used with hexagonal holes. The integrally fitting relation is used for just allowing the relative forward rotation, but incapable of being reversed, between the screw rod and the nut caps, no matter what kind of fitting is adopted.

The effects of the present invention include as follows:

The bolt with self-locking energy storage device of the present invention is

designed by adequately embodying the resilience feature of spring and the effect of friction force as well as utilizing the direct or indirect engagement between the thread and coil spring, while allowed for integrating the energy storage, self-locking, mutual locking, inter-locking, and automatic pretension means into one unit. Each part in this device may be individually allowed for unidirectional self-locking. Owing to the mutual locking between the energy storage spring and the screw rod, mutual locking between the screw rod and the screw hole, mutual locking between the energy storage spring and the screw nut, mutual locking between the screw nut and the screw rod, as well as the self-locking of the screw nut itself, relative rotation may be still possible under the effect of the stored mechanical energy, while the reverse rotation may be prohibited. That is, all of the coupling portions are allowed to be rotated tightly, while incapable of being reversed.

This device comprises several advantages, for instance: an appropriately compact structure, the omission of the additional fittings, such as double nut, piercing open lock, spring washer, flat washer, steel wire clack, and anti-withdrawal plate, as examples, and the assembling process therefor; and particularly, a prolonged service life and an enhanced safety together with reliability, significant damage prevention, standardized and systemized production.

It is convenient for disassembling the machine, due to the unlocking hole and unlocking groove provided in the device of the present invention. When disassembling, firstly, the outer hook 24 of the energy storage spring is picked from the blind hole 31. After the energy is released, the energy storage spring 2 is withdrawn by the reverse rotation against the end 23 of the inner spring. Subsequently, an aluminum rivet or other soft metallic wire is inserted into the unlocking hole 32, and pushed against the free end 52 or 62 by the hammer and nail. In this case, the self-locking state of the nut cap 3 and the lower nut cap 4 is relieved, such that these two nut caps may be wrenched off as the common screw nut. The mechanical principle is that oppressing the free end, and directing the external force to the fixing end and against the resistance applied by the fixing end, in such a way that the inner diameter of the self-locking spring is enlarged, and the friction is eliminated correspondingly. Secondly, the whole bolt is disassembled by means of the forced reverse rotation provided by the wrench, such that the snap head 8 at the bottom of the screw rod 1 may be destroyed. As such, the bolt may be disassembled as a whole, and only the replacement of the snap head 8 is required for the next assembly. The mechanical principle is that the self-locking and mutual locking forces applied by the energy storage spring, upper nut cap, and lower nut cap at the upper portion of the screw rod are extremely large, while the diameter of the hexagonal head 81 at the fitting connection between the snap head 8 and the screw rod 1 is thinner, so as to be

possibly wrenched out by mighty force, resulting in deformation or break. The lower locking spring of the screw rod may be taken out, such that renewed installation is allowed if the snap head is replaced.

The primary parts of the aforementioned device may be either totally utilized, or partly or individually used with the common standard screw rod or screw hole depending on the requirement. Base on the practical requirement, the unlocking hole may be not necessary, and the direct connection at the open groove on the bottom of the screw rod may be also used, instead of the snap head, for the fixing between the lower locking spring and the screw rod. It is still possible for the energy storage spring to be used with the common standard bolt individually and directly in replace of the fittings, such as open lock, for example.

The bolt with self-locking energy storage device is mainly designed so as to be cooperated with the current common standard screw rod or screw hole based on international standards, without the need for changing cooperative parts, resulting in superior interchangeability and generalization, as well as more excellent practicability.

LIST OF REFERENCE SYMBOLS

1	bolt
2	energy storage spring
3	nut cap
4	lower nut cap
5	upper locking spring
6	middle locking spring
7	lower locking spring
8	snap head
11, 33, 42	standard thread
12	unlocking groove
13	non-standard thread
14	recess hole
21	inner locking spring
22	outer torsional spring
23	free end
24	outer hook
31	blind hole
35	fixing groove
41	reverse thread
43	unlocking hole

51, 61, 71	fixed end
81	projecting post
82	fixing groove

CLAIMS

1. A bolt with self-locking energy storage device comprising a screw rod and a nut cap, wherein the inner wall of said nut cap is engaged with an upper locking spring; the bottom end portion of said nut cap is provided with a lateral unlocking hole, and the top end face thereof is provided with a fixing groove, one end of said upper locking spring being snapped in said fixing groove, while the other end thereof being inserted into said unlocking hole.

2. The bolt according to Claim 1, wherein said screw rod includes two portions with different diameters, a nearly lower portion thereof having a smaller diameter being engaged with a lower locking spring, the bottom end portion of a portion having a larger diameter being provided with an unlocking groove; the bottom end portion of said screw rod being provided with a fixing groove into which one end of said lower locking spring is hooked, and the other end thereof being a free end inserted in said unlocking groove of said screw rod, in which threads of said two portions are formed as a unified spiral after said lower locking spring is assembled.

3. The bolt according to Claim 2, wherein said nut cap further comprises a lower nut cap having a thread the same as that of the nut cap, said lower nut cap and said nut cap being coupled as an unit, the inner wall of said lower nut cap being engaged with a middle locking spring.

4. The bolt according to Claim 3, wherein at the outer diameter of said screw rod, there is engaged with an energy storage spring having an inner locking spring with self-locking effect and an outer torsional spring with thrust effect.

5. The bolt according to Claim 3, wherein the inner wall of said nut cap is divided into upper and lower sections with different inner diameters, said upper section with a smaller inner diameter being engaged with said upper locking spring, while said lower section with a larger inner diameter being fitted with the outer wall of said lower nut cap, in which the top end face of said nut cap is further provided with a blind hole into which the end portion of said energy storage spring is inserted.

6. The bolt according to Claim 3, wherein said lower nut cap is presented as a hat-like body having an inner thread, said inner thread thereof being engaged with that of said middle locking spring, the outer wall thereof being fitted with said nut cap, the top end face thereof being provided with a fixing groove, the flat brim thereof being provided an unlocking hole.

7. The bolt according to Claim 3, wherein one end of said middle locking spring is provided with a thicker fixed end, snapped in said fixing groove of said lower nut cap, and a free end of said middle locking spring is inserted into said unlocking hole of said lower nut cap.

8. The bolt according to Claim 2, wherein at the center of the bottom end face of said

screw rod, there is provided with a recess hole into which a snap head is inserted, said fixing groove at the bottom end of said screw rod being disposed on said snap head.

9. The bolt according to Claim 8, wherein said snap head is presented as "⊥ " shape, the top end thereof being provided with a projecting post fitted with said recess hole at the end portion of said screw rod, while the bottom face thereof being provided with a fixing groove used for the installation of said lower locking spring.

10. The bolt according to Claim 6, wherein the fitting connection between said nut cap and said lower nut cap: said lower section of the inner wall of said nut cap having a thread with a smaller thread pitch, while the outer wall of said lower nut cap having a thread engaged with said thread of said nut cap.

11. The bolt according to Claim 6, wherein the fitting connection between said nut cap and said lower nut cap: the cross section of the inner wall at said lower section of said nut cap is presented as hexagon, while the cross section of the outer wall at said upper section of said lower nut cap is presented as hexagon fitted with the former.

12. A bolt with self-locking energy storage device comprising a screw rod and a nut cap, wherein said screw rod includes two portions with different diameters, a nearly lower portion thereof having a smaller diameter being engaged with a lower locking spring, in which threads of said two portions are formed as an unified spiral after said lower locking spring is assembled.

13. A bolt with self-locking energy storage device comprising a screw rod and a nut cap, further comprising an energy storage spring engaged with the outer diameter of said screw rod, said energy storage spring including an inner locking spring with self-locking effect and an outer torsional spring with thrust effect, the top end face of said nut cap being provided with a blind hole into which the end portion of said outer torsional spring is inserted.

ABSTRACT

There is disclosed a bolt with self-locking energy storage device comprising a screw rod, and an energy storage spring, an upper locking spring, a middle locking spring, a lower locking spring engaged with the screw rod directly, as well as an upper nut cap, a lower nut cap engaged with the screw rod indirectly. The bottom portion of the screw rod is further provided with a snap head used for preventing the looseness of the bolt. The lower locking spring is allowed for wrapping around the nearly lower end of the screw rod. The exteriors of the upper locking spring and the middle locking spring are threadedly connected to the upper nut cap and the lower nut cap, respectively. The top end of the upper nut cap is fixed with the energy storage spring. The nearly lower end of the screw rod is provide with a non-standard thread engaged with the lower locking spring, and the nearly upper end thereof is provided with a standard thread. At the center of the bottom end face of the screw rod, there is provided with a recess hole used for fixing the snap head. This device is allowed for not only avoiding looseness and detachment of the bolt, but also releasing the stored energy simultaneously once the loss of fastening force resulted from wear, fatigue, deformation arises

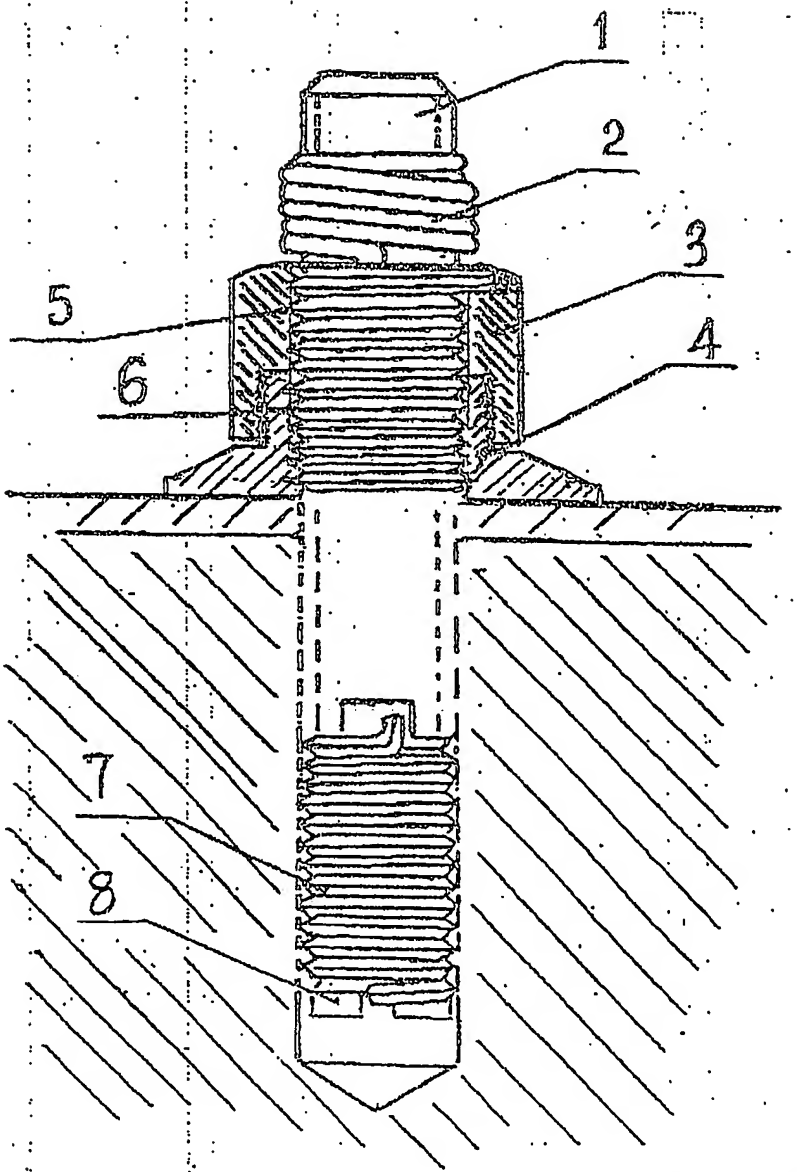

FIG. 1

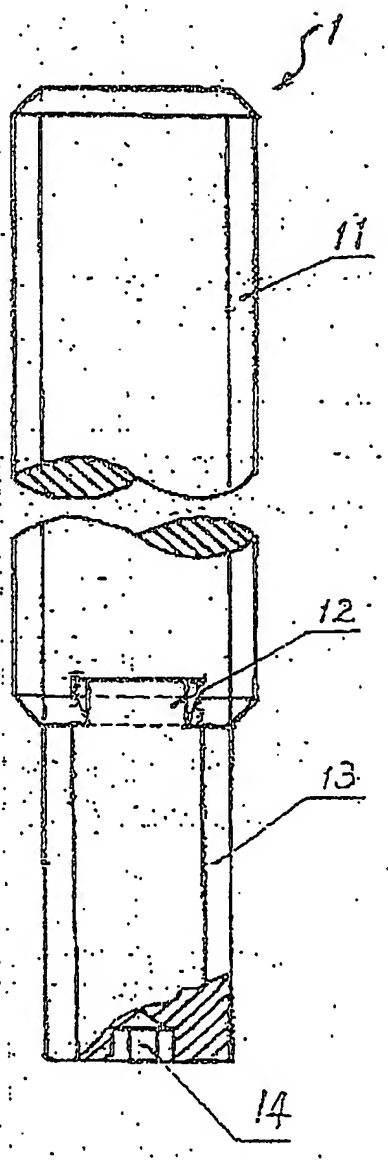

FIG. 2

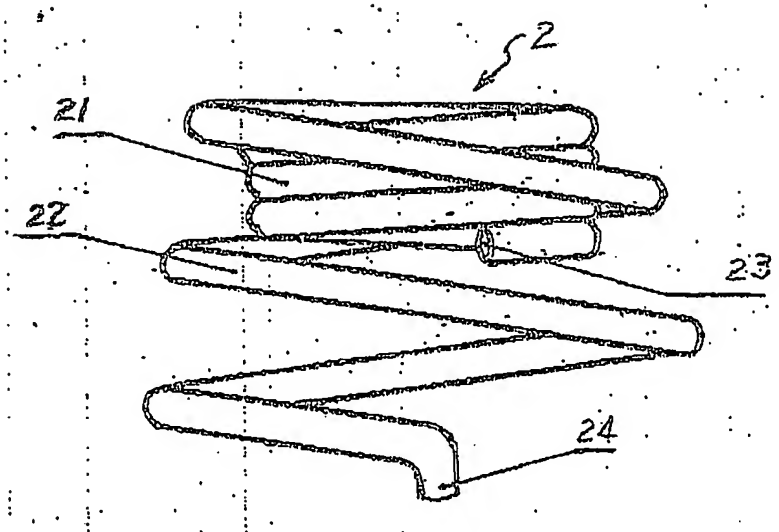

FIG. 3

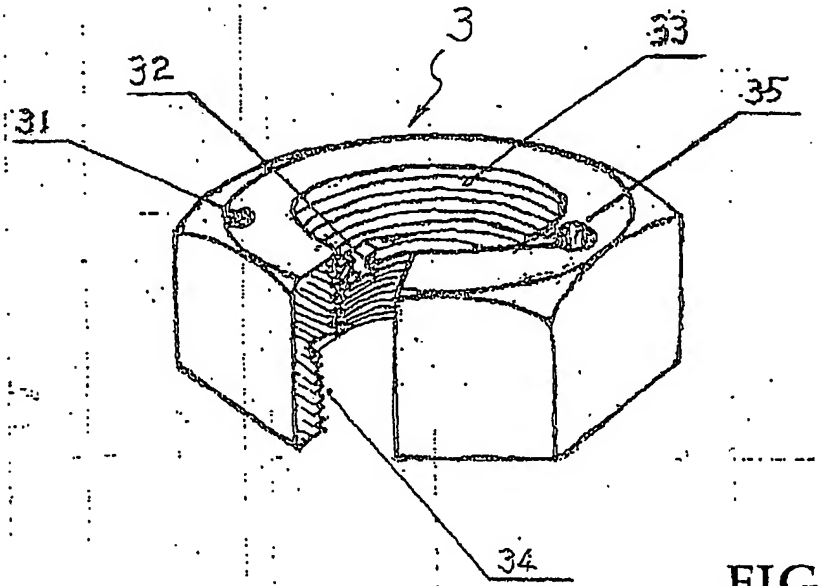

FIG. 4

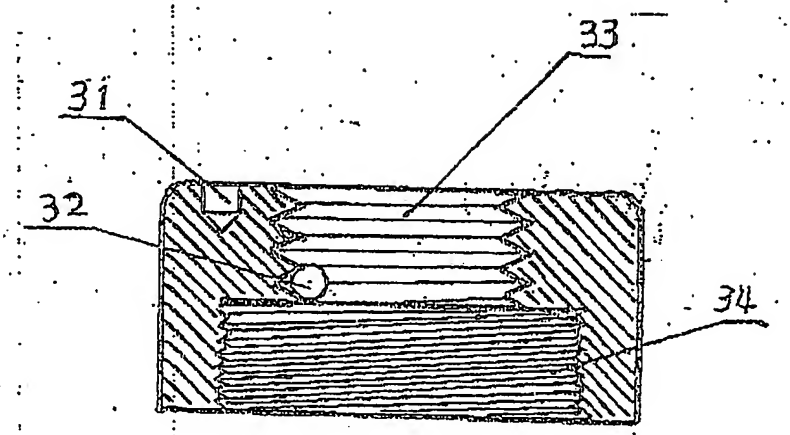

FIG. 5

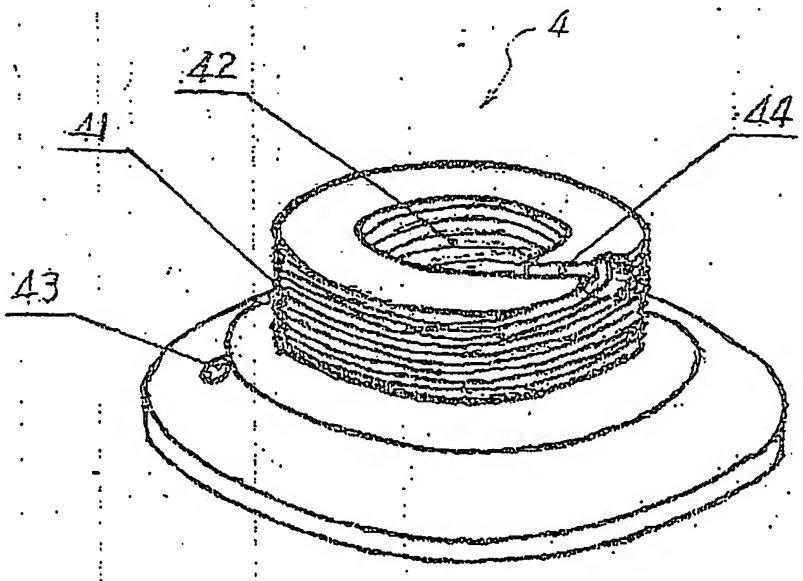

FIG. 6

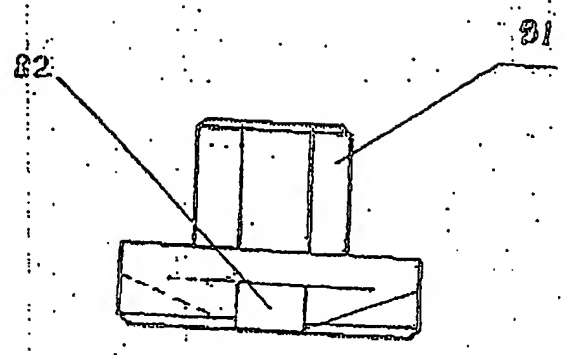

FIG. 7

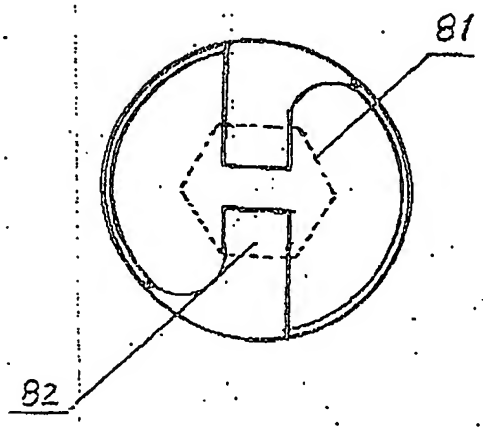

FIG. 8

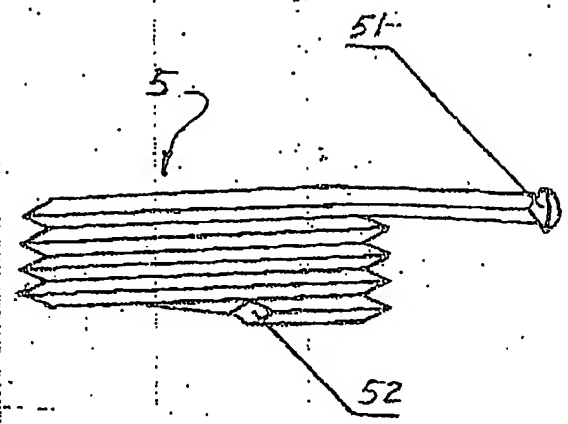

FIG. 9a

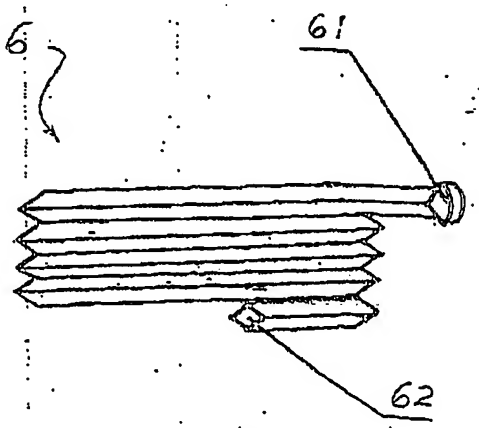

FIG. 9b

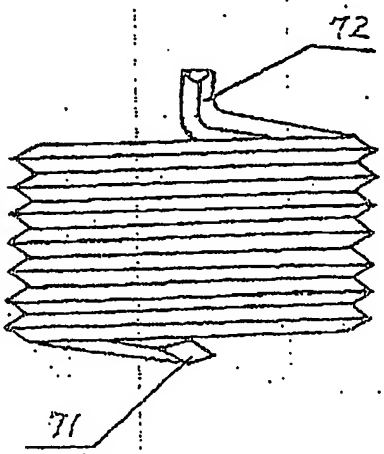

FIG. 9c